A Navigation Summary of OMM9 Performance

OMM9 was implemented on 15 January 1996 at the scheduled burn centroid time of 19:10:41 UTC. The commanded ΔV magnitude was 2.498 mm/sec, compared to an ideal value of 2.50 mm/sec. This maneuver was applied in the orbit along-track direction to increase the mean semimajor axis by ~5.37 meters to reverse the satellite ground track drift westward and thereby remain inside the ±1-km control band. At the time of the maneuver, the ground track was ~58 meters inside the eastern control boundary.

The maneuver sequence was executed as planned until the unwind turn to resume yaw steering. During this turn an unexpected sequence of seven pulses was issued by the A2 and C3 attitude control thruster pair. These pulses (280 msec each) were issued because the 3-wheel momentum control limits had been loaded in OBC following the safehold recovery in December 1995 rather the required 4-wheel values. The result was unwanted impulse along the satellite +Y axis, significantly increasing the net along-track velocity change.

Orbit determination performed by the GSFC/FDF following the maneuver estimated a total ΔV of ~3.65 mm/s (~46% high) resulting from the combined effects of the OMM9 burn and the seven attitude control firings. The OMM9 burn performance cannot be confidently isolated without a rigorous and highly uncertain reconstruction of the effective ΔV resulting from these anomalous thruster firings. The uncertainties in this process greatly exceed the accuracy necessary to establish meaningful OMM9 performance. For these reasons the OMM9 performance cannot be included in the database used to support future OMM designs.

The large net overburn has resulted in a predicted ground track western boundary crossing at the end of February 1996. However, this westward drift can be arrested using the fixed yaw period in January-February by applying the solar array lead/lag strategy to increase orbital decay. The initial plan is to enter fixed yaw on 26 January 1996 when $\beta' = -26.7$ deg and resume yaw steering again on 14 February 1996 when $\beta' = +26.7$ deg. Applying a lead solar array pitch angle prior to the yaw flip and a lag angle afterward reduces the semimajor axis throughout the fixed yaw period. This plan may be refined to account for observed orbit and ground track behavior.

The adaptive use of the fixed yaw periods to modulate orbital boost and decay forces with changes in the fixed yaw control limits and/or use of the lead/lag strategy is expected to continue as necessary to maintain confident ground track control.

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Navigation Team Chief